Remarks

I. Status and Nature of the Amendments

Claims 2-11 are pending, claim 1 having been previously canceled without prejudice or disclaimer to its reintroduction in this application or introduction into a future continuation or divisional application.

II. The Rejection of Claims 2-11 Pursuant to 35 U.S.C. § 103 in Light of U.S. Patent No. 6,592,810 (Nishida *et al.*)

Claims 2-11 have been rejected under 35 U.S.C. § 103(a) as obvious in light of U.S. Patent No. 6,592,810 (Nishida *et al.*). Specifically, the Examiner has advised that Nishida et al. disclose a Fe-Ni-Co alloy composition having constituents whose wt% ranges overlap with those recited in the presently pending claims. The Examiner has further advised that it would have been obvious to one of ordinary skill in the art to have selected Applicants' claimed alloy wt% ranges from the broader disclosure of the prior art. Applicants respectfully traverse and request reconsideration.

As the Examiner will appreciate, the present invention is directed to a Fe-Ni-Co alloy thin strip for shadow masks comprising, on a mass basis, 30 to 35% Ni, 2 to 6% Co, 0.1 to 0.4% Nb, 0.2 to 0.5% Mn, and the rest Fe and unavoidable impurities, wherein the unavoidable impurities comprises 0.005% or less C, 0.002% or less S and 0.005% or less N and precipitates and inclusions are 0.2 μm to 5 μm in size and the total mass of them is 0.5 $\mu g/mm^3$ to 1.5 $\mu g/mm^3$. Dependent claims recite that the grain size is 7 to 10 in terms of grain size number stipulated in JIS G 0551.

The Japanese counterpart of the cited Nishida *et al.* Patent was described in the description of the related art of the present application (see, Japanese Patent Laid-Open No. 2001-262278). The Applicants made the present invention in order to improve the magnetic properties of the compositions disclosed in the cited Nishida *et al.* Patent, and

specifically to address a phenomenon in the magnetic properties of such compositions that had been found to occur. Specifically, Applicants observed that magnetic drifts became very large when fine-grained nitrides and carbides were precipitated as described in the cited Nishida *et al.* document. The Applicants found that the magnetic properties of the Nishida *et al.* compositions deteriorated when Nb nitrides and Nb carbides are precipitated, and used the method of strength improvement by solid solution of Nb to address this problem. A higher concentration of Nb was found to be necessary in order to form a sufficient solid solution of Nb. The Applicants additionally found that the magnetic properties were improved if Si was allowed to exist in the alloy not as a precipitate or inclusion, but as a solid solution Si.

In addition to the content adjustment, precipitates must be solid soluted again by heat treatments to decrease precipitates amount for sufficient solid solution of Nb and Si. Since the heat treatments must be done at high temperature for sufficient solid solution of Nb and Si, grain size becomes large. The suitable range of the grain size is 7.0 to 10.0 (e.g., 9.6) in terms of the grain size number stipulated in JIS G 0551.

The effects that the size of the precipitates and inclusions exert on the magnetic properties are negligible when the size is more than 5 μm and it is difficult to correctly recognize the precipitates and inclusions less than 0.2 μm in size. Therefore the suitability of the magnetic properties was determined from the amount of precipitates and inclusions 0.2 μm to 5μm in size.

The differences between the compositions of the present invention and those of the cited Nishida *et al.* Patent are summarized in the Table below.

	The Present Invention		Nishida *et al.* Patent	
	Range	**Action**	**Limitation**	**Action**
Nb	0.1 ~ 0.4%	If the content of the Nb is too small, the strength of the alloy strip cannot be sufficiently improved without recourse to the use of precipitates and the magnetic properties of the same deteriorate, whereas if the content of Nb is too large, the thermal expansion coefficient of the alloy becomes large.	0.005 ~ 0.1%	To fine grain size by ultrafine precipitation of NbN with an extremely small amount of Nb. If the amount is more than 0.1%, rough and large size NbN is crystallized.
Solid Solution Si	0.03 ~ 0.10%	It is preferable for the magnetic properties that Si be allowed to exist in the alloy as a solid solution Si. The effect is not sufficient if the content of solid solution Si is less than 0.03%. However, if the content of solid solution Si is more than 0.10%, the thermal expansion coefficient of the alloy is increased.	No Description	No Description
Grain Size (no.)	7 ~ 10	Grain Size grows by solid solution of Nb and Si. If the grain size is less than 7, the grain size is too large, whereby holes with rough edge are produced by etching. If the grain size is more than 10, sufficient magnetic properties cannot be obtained because solid solution of Nb and Si is not enough.	More than 10	To fine grain size and make high strength
Precipitates, etc.	0.5 ~ 1.5 μg/mm^2 of precipitates and inclusions of 0.2 ~ 5 μm in size	Applicants considered not only precipitates but also inclusions. The smaller the amount of precipitates and inclusions having a size in such range, the better the magnetic properties become. However, with the decrease in such an amount, the strength of the alloy is also decreased.	Maximum grain size of NbN and NbC is less than 0.5 μm and more than 50,000/mm^2	To fine grain size by ultrafine dispersed precipitation. The maximum grain size of the examples is 0.15 μm. High strength can be obtained without using rough and large size carbides.
Magnetic Properties (Coercive force)	Less than 50 A/m	Coercive force is to be lowered in order to obtain sufficient magnetic shielding performances	No description	No description

As the Examiner will appreciate, although the range of Nb, the range of grain size and the range of the size of the precipitates etc. of the present invention are similar to those disclosed in the Nishida *et al.* Patent, the purpose of the present invention is to improve the magnetic properties of the composition, and Applicants have found that Nb, solid solution Si, grain size, inclusions etc. affect the magnetic properties and that an excellent material having desired magnetic properties can be obtained by controlling these parameters respectively within the prescribed ranges being claimed by Applicants. It is therefore respectfully submitted that the claimed ranges result in an unexpected benefit (improved magnetic properties), and that the elucidation of such claimed ranges is neither taught nor suggested in the cited Nishida *et al.* Patent. Accordingly, Applicants respectfully submit that the invention of claims 2-11 are not obvious in light of the cited Nishida *et al.* Patent.

As the Examiner will further note, only the purposed improvement of strength is disclosed in the cited Nishida *et al.* Patent, and limitations that conflict with the present invention which improve the magnetic properties are done concerning Nb and grain size. On the subject of the precipitates, Nishida *et al.* teach the improvement of strength by fining the grain size by ultrafine precipitation, while the present invention teaches the formation of a solid solution to address this concern. Actually, the maximum size of the precipitates (niobium nitrides) is 0.15 μm in the examples of the cited document, which is less than the lower bound of the range being claimed by Applicants. Moreover, it is submitted that Nishida *et al.* provide no teaching concerning solid solution Si. Applicants accordingly and respectfully submit that the cited Nishida *et al.* Patent would not have motivated those of ordinary skill to achieve the compositions being presently claimed by Applicants.

The Examiner has indicated that the range of Nb in the present invention shown in Table 1 of the specification does not establish criticality. More specifically, the Examiner has indicated that Co and Mn are outside the claimed range though alloy N contains Nb of 0.06% and alloy Q contains Nb of 0.01 %, and that to establish the criticality of the lower

limit of 0.1% Nb, comparative data with examples slightly less than 0.15% of the lower limit is necessary.

Applicants respectfully submit that not only Nb but also Co and Mn are outside the range of alloy N and that the thermal expansion coefficient becomes large when Co comes off as disclosed in the examples of the present invention (please see Table 2 of the specification). In addition, WO 01/59169, which is cited in the present application discloses the range of Co and the basis for the limitation. Moreover, the detailed description of the preferred embodiments of the present application teaches that if the content of Mn is too small, segregation of nickel sulfide occurs at the grain boundaries and causes an unavoidable deterioration of hot-workability; and that if the content of Nb is too small, the strength of the alloy strip cannot be sufficiently improved without recourse to the use of precipitates and the magnetic properties of the same deteriorate.

In other words, in the examples provided in Table 2 of the present invention, Co and Mn do not significantly influence 0.2 yield strength and the influence of Nb predominates. In the examples, it is shown that 0.2 yield strength is lower than No. 1 to 8 of the present invention which contains Nb over 0.1 though its value is 302 MPa which is higher than the lower bound of the target. Therefore, Applicants respectfully submit that Table 1 establishes the criticality required by the Examiner.

IV. Concluding Remarks

Having now responded to all of the Examiner's rejections, Applicants respectfully submit that the present application is in condition for Allowance of all claims, and earnestly solicit early notice of such favorable action. The Examiner is respectfully invited to contact the undersigned with respect to any issues regarding this application.

Respectfully Submitted,

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